Understanding and Predicting Changes in the Workforce for Ocean Sciences, Technology, and Operations

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LONG-TERM GOALS

Our major long-term goals for this project are:

1. Develop improved assessment of the ocean science, technology, and operations (OSTO) workforce.

2. Anticipate future requirements for this workforce.

3. Identify educational processes needed to develop this workforce.

OBJECTIVES

Our major objectives are:

1. Characterize the present workforce that supports ocean observing systems (OOS), with OOS defined broadly to include activities closely and commonly related to ocean observing, such as ocean analysis and forecasting.

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14. ABSTRACT
Characterize the present workforce that supports ocean observing systems (OOS), with OOS defined broadly to include activities closely and commonly related to ocean observing, such as ocean analysis and forecasting.

15. SUBJECT TERMS

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2. Characterize the present workforce that supports that supports OSTO components that are similar to the OOS component.

3. Identify the types of information required to monitor the evolution of the OSTO workforce over the next two decades, identify the most probable future workforce scenarios, and design initial workforce prediction systems.

4. Identify education and training objectives and practices that effectively address current and anticipated OSTO workforce needs.

APPROACH

Our approaches for the four main objectives are:

1. Characterize the present OOS workforce via surveys of OOS organizations.

2. Characterize the present OSTO workforce via: (a) surveys of OSTO employers and employees; and (b) focus groups with employees.

3. Identify information needed to monitor the evolution of the OSTO workforce, identify probable future workforce scenarios, and design initial workforce prediction systems via: (a) a workshop on OSTO workforce analysis and prediction.

4. Identify education and training objectives and practices via a workshop on OSTO workforce education.

This work is being conducted in collaboration with Dr. Sharon Franks and Dr. Cheryl Peach at Scripps Institution of Oceanography (SIO), Dr. Lisa Campbell at Texas A&M Univsersity (TAMU), Janice McDonnell at Rutgers University (RU), Bruce Gilman of the Marine Technology Society, and Drew Michel of ROV Technologies, Inc. The focus groups will be held at TAMU. The first workshop will be held at RU, and the second workshop will be held at SIO.

WORK COMPLETED

We have developed an online tool for collecting and analyzing data from OOS employers, including organizations that are members of regional OOS, NPS, SIO, TAMU, RU, and federal government organizations (e.g., Naval Oceanographic Office, NOAA). Preliminary data has been analyzed. Initial interviews with key supervisors and senior managers have been scheduled. We are preparing online tools for collecting and analyzing data on the broader OSTO workforce. We have reviewed and synthesized workforce prediction studies in related science, technology, and operations fields and have completed a draft report.

We have conducted a number of meetings to coordinate and collaborate with related workforce, professional development, and education efforts being conducted by NOAA, USGS, Naval Meteorology and Oceanography Center, Ocean Research and Resources Advisory Panel (ORRAP), Department of Labor, Marine Technology Society, universities, and others. These meetings have been very useful to our project in giving us access to existing data and data analyses, and providing

opportunities for us to collect data. We have organized an ocean workforce session, and a workshop on the future of the OSTO workforce, that will be held at the Ocean Sciences Meeting to be held in March 2007. The session and workshop will be used to our project in helping us disseminate information from our project, collect information from related projects, and refine the plans for our two workshops. More information on the session and workshop are available at: http://aslo.org/orlando2008/program.html.

RESULTS

Our major results are the data sets we have developed and the data analyses we have conducted. The data sets include the initial data from our online data collection process and from collaborations with employers (e.g., Naval Meteorology and Oceanography Center). The data analyses are focused on to determining:

1. The major variables that help describe the workforce, including the status, evolution, and future of the workforce

2. The major relationships between these variables that help describe the processes that force changes in the workforce

3. Key methods for modeling these relationships to allow simulation and prediction of the workforce.

Through examinations of prior workforce studies, and discussions with OSTO organizations, we have identified a number of variables, and variable relationships, that appear to be critical in characterizing the present and future state of the OSTO workforce (e.g., variables involved in determining the supply of and demand for workers). These variables are represented in our online data collection tools. Sample images of an online survey are shown in Figures 1 and 2, and a sample result from our preliminary data analyses is shown in Figure 3.

Ocean Observing Systems Workforce Study
Employer/Supervisor Survey

The MATE Center and collaborating institutions are conducting a study of the ocean science, technology, and operations (OSTO) workforce, with a focus on the ocean observing system (OOS) workforce. As a valued member of the ocean science community, we are asking your help to characterize your organization's workforce. This information will help our community to better understand workforce needs and design educational programs aligned with these needs. This is a confidential survey that will be entered into a large database for statistical purposes only and will not be linked to you by name.

Please use this form to collect and organize the information that you will need to complete the online survey. Please complete the online survey in one session.

Thank you,

Deidre Sullivan, *Marine Advanced Technology Education (MATE) Center*
Tom Murphree, *Naval Postgraduate School*
Leslie Rosenfeld, *Naval Postgraduate School*

This project is funded by the National Oceanographic Partnership Program.
Additional information about this project can be found at: www.marinetech.org/OSTOworkforcestudy

Please answer all the questions on the next four pages. This will prepare you for the online survey which must be completed in one session.

1. Your first and last name:

First

Last

2. Name of the company/organization at which you work:

7. Name of the department/organizational unit (e.g. lab or division) in which you work:

8. How many employees are employed in the department/organizational unit for which you are completing this survey form? *(Please include yourself.)*

Full-time   Part-time   On-site contractors

Figure 1. Sample image of online tool for collecting data on the workforce that supports ocean observing, analysis, and forecasting systems.

15. For each job title/function, please indicate the number of workers, the percentage of time spent on OOS activities, entry level and experienced staff annual compensation, and difficulty in hiring entry level and experienced staff.

Using the lists of job titles/functions in the question below, please categorize the workers in your department/organizational unit. The job titles/functions are broken into four categories:

    A. Design, Operation and Maintenance of Facilities, Platforms and Instrumentation
    B. Data Collection, Analysis, Modeling, Forecasting and Interpretation of Ocean Information
    C. Data and Information Management
    D. Education, Outreach and Applications.

Please read all the job titles/functions before beginning, and assign each employee only one job title/function. We recognize that some workers may have more than one job title/function. Please do your best to assign such workers according to their main type of work. If there is not a good match between your department's job titles/functions and those listed below, you will be able to list additional job titles/functions in another area.

A. Design, Operation and Maintenance	Number of workers	Percentage of time related to OOS (0,1-24, 25-49, 50-74, 75-100)	Entry level staff annual compensation	Experienced staff annual compensation	Difficulty in hiring entry staff (easy, slightly difficult, difficult, impossible)	Difficulty in hiring experienced staff (easy, slightly difficult, difficult, impossible)	Anticipated number of hires in next two years
Divers and Support Personnel							
Engineer – Electrical							
Engineer – Mechanical							
Engineer – Structural							
Machinist/Welder/Fabricator/Carpenter							
Ship Officer							
Ship Crew							
Technician – Electronics							
Technician – Hydraulics							
Technician – Marine							
Technician – Marine Electronics							
Technician – Remote sensing							
Underwater Vehicle Pilot/Technician							

B. Data Collection, Analysis, Modeling							
Biological Oceanographer/Marine Biologist/Ecologist							
Chemical Oceanographer							
Environmental Modeler/Ocean Forecaster							
GIS Analyst/Technician							
Hydrographic Surveyor/Technician							
Hydrologist							
Marine Geologist/Geophysicist							
Meteorologist/Atmospheric Scientist							

Figure 2. Sample image of online tool for collecting data on the workforce that supports ocean observing, analysis, and forecasting systems. This image provides an example of the types of data collected for different categories of workers.
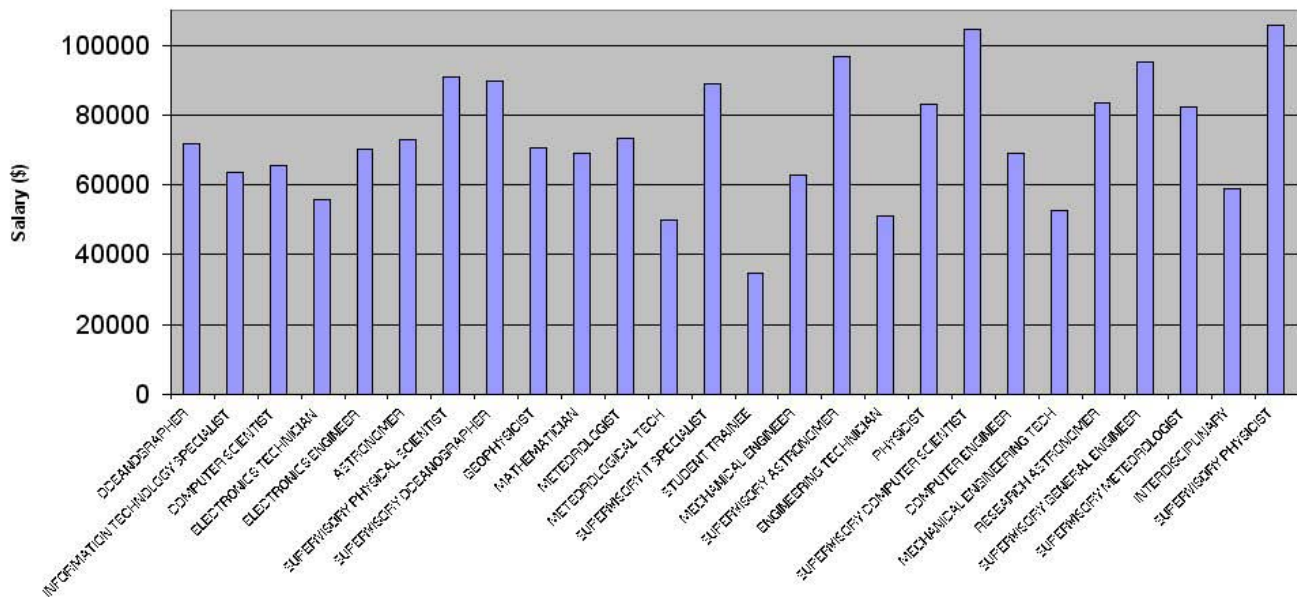
Figure 3. Sample results from preliminary analyses of ocean workforce data. This sample shows annual average salaries for major occupations that support ocean observing, analysis, and forecasting systems. For this preliminary data set, the approximate annual average salaries range from $35,000 for student trainees to $105,000 for supervisory physicists and supervisory computer scientists, and the mean annual average salary for all occupations is approximately $60,000.

IMPACT/APPLICATIONS

The results from this project will contribute to: (1) the analysis, monitoring, and prediction of the nation's ocean science, technology, and operations workforce; and (2) the education and professional development. Thus, these results have the potential to impact the development, implementation, and effectiveness of a wide range of ocean related activities, including resource extraction, environmental management, and national defense. Our meetings and collaborations with employers, employees, educators, and professional and industry organizations has revealed a great deal of concern about the future evolution of the ocean workforce, and high degree of interest in the results of this project.

RELATED PROJECTS

In a closely related ocean workforce project, we are assessing the need for a national certification program for oceanographic professionals. Certification is a way to recognize individuals who have demonstrated professional competence in an occupational field. We are focusing our study on the pros and cons of an optional credential granted by non-governmental agencies such as professional societies. We distinguish professional certification from educational certificate programs that attests to the completion of a course of study. Potential advantages of a certification program include increased visibility for the profession, aid in evaluation of job applicants, encouragement of career-long learning, and increased confidence in the oceanographic community by users of oceanographic products and services. Possible disadvantages include costs and labor involved in administration of a program, and the personal effort that applicants would need to undertake. The experiences of certification programs in related fields (e.g., meteorology, environmental science, ecology, and fisheries) and foreign

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certification programs for marine scientists have provided useful insights into the process of designing, implementing, and maintaining a certification program. We are collecting information on the need for a certification program through meetings with professional societies; employer and employee surveys and interviews; and facilitated workshops. This project is funded by the National ocean Service of the national oceanic and Atmospheric Administration. The project web site is: http://marinetech.org/cpop

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